REMARKS

Applicants respectfully request reconsideration and allowance of the pending claims.

I. Status of the Claims

Upon entry of this amendment, claims 1 through 69 remain pending.

Claims 1, 24, 25, 32, 55, and 56 have been amended to define the classes of amines that are principal amines and auxiliary amines. Auxiliary amines comprising epoxy-amines are defined in original claim 10. Auxiliary amines comprising polyetheramines are defined in original claim 11. Auxiliary amines comprising aryl moieties or cycloalkyl moieties are defined in original claim 15. Principal amines comprising epoxy-amine adducts are defined in original claim 17. Principal amines comprising linear polyalkylamines are defined in original claim 18 and in the specification at paragraphs [0035]-[0038].

Various dependent claims have been amended to make these dependent claims consistent with the amended independent claims.

New claims 94 and 95 are supported by paragraph [0114] of the published application.

New claim 96 is supported by Example 4.

New claim 97 is supported by Examples 1 and 2.

New claim 98 is supported by Example 3.

New claim 99 is supported by Example 6.

II. Information Disclosure Statement

This response is being filed with an information disclosure statement.

III. Claim Rejections Under 35 U.S.C. §112, first paragraph

A. Written Description

Reconsideration is requested of the rejection of claims 1-5, 9-12, 17-36, 40-43, and 48-69 as failing to comply with the written description requirement.

In response filed April 27, 2009, support for the half-life was stated to be found in paragraph [0014]. This statement of support was a typographical error. Written description support for the half life of the microcapsules being between 5 days and 100 days may be found in paragraph [0114], which states:

> **[0114]** Accordingly, the preferred half-life of microcapsules to be applied to crops depends upon numerous factors, including the identity of the crop, the identity of the agricultural chemical, and the weather and soil conditions during the growing season. One skilled in the art may take such factors into account and select a herbicidal formulation of the present invention having a useful half-life. For example, a preferred dispersion for application to corn crops under many environmental conditions comprises acetanilide-encapsulated microcapsules ***with a measured half-life of at least about 5 days***, more preferably at least about 30 days and even more preferably at least about 45 days. Microcapsules with half-lives which are too short may not be bioeffective for the required duration (i.e., until the crops are harvested or have established a canopy). Furthermore, microcapsules with a half-life which is too long may not be bioeffective soon enough after application and may wastefully release pesticide long after pesticide is required to protect the crops. Thus, the microcapsules preferably ***have a half-life no greater than about 100***, about 80, or even about 60 days, although microcapsules having a half-life ranging from about 60 to about 100 days are useful when the dispersion is formulated with an unencapsulated herbicide to provide protection in the days immediately following application.

The specification as originally filed contains a statement that preferred dispersions of microcapsules have a minimum half life of 5 days to be bioeffective for the required duration while the half life should be no greater than 100 days so as to provide effective control immediately following application. From this description, the ordinarily skilled person would have been able to appreciate that the applicants possessed and described microcapsules having half lives within the claimed range based on this description.

B. Enablement

Reconsideration is requested of the rejection of claims 1-5, 9-12, 17-36, 40-43, and 48-69 as failing to comply with the enablement requirement.

The enablement rejection is based on the Office's assertion that "...the specification ... does not reasonably provide enablement for a pesticidal material according to claim 1 having any principal amine and any auxiliary amine in any amount, and having a half-life ranging from about 5 days to about 100 days, as currently claimed. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the invention commensurate in scope with these claims." The rejection also states that the specification discloses only a particular combination of amines within a particular ratio that result in microcapsules having half lives within the claimed range.

The repetition of the word "any" indicates that the enablement rejection is predicated at least in part on the view that applicants' specification must enable preparation of microcapsules having half lives within the claimed range from any combination of amines. Reconsideration is requested of the rejection in the first instance since the claims have been

amended herein to specifically define the classes of amines that are auxiliary amines and principal amines. The breadth of the claims (Wands factor 8) has thus been substantially narrowed. The independent claims thus do not define the auxiliary and principal amines to cover ***any*** amines. Only certain classes of amines qualify as auxiliary amines, and only certain classes of amines qualify as principal amines. Thus, only certain combinations of auxiliary amines and principal amines are possible from these classes.

It is further incorrect to characterize the specification as not enabling any skilled person to make and use the invention commensurate with the scope of the claims in view of the multiple examples of microcapsules having half lives within the claimed range. The present Office Action only credits a particular combination of amines within a range of amine ratios as resulting in microcapsules meeting the half life definition. There are, in fact, several additional examples of amine combinations that result in microcapsules meeting the half life limitations (Examples 1, 3, and 6) and disclosures of trend data (e.g., FIG. 1B, FIG. 2, Example 6) that enable the ordinarily skilled person to readily select a variety of amine combinations and ratios that result in microcapsules having a wide range of half lives, including the half life range of the claims.

For example, as pointed out by the Office, there are several examples in Example 3 that describe how to make such microcapsules, including Examples 3E, 3F, and 3G. It is incorrect to assert that these are the ordinarily skilled person is essentially limited to only these examples. FIG. 2 displays how the half life is a function of the %equivalent MXDA. From this chart, the ordinarily skilled person can easily prepare

microcapsules ranging in half life from less than a day to about 27 days.

Additional examples include Examples 1A, 1B, 1C, and 2, which describe microcapsules in which the polyurea shell wall is prepared using a blend of Jeffamine EDR148 and Jeffamine T403. The structures of these amines are attached to this amendment. As described in paragraph [0196], the Example 1B microcapsules had a half life of release of 33 days. FIG. 1B depicts a chart showing the effect of half life on the ratio of Jeffamine EDR148 and Jeffamine T403. It would be within the skill of the ordinarily skilled person to utilize this chart to prepare microcapsules having half lives ranging from approximately 5 days to 1000 days, and any half life in between including the claimed half life range. This chart shows that the half life is about 100 days when the % equivalent Jeffamine T-403 is about 35% and falls below 5 days when the % equivalent Jeffamine T-403 is slightly over 60%.

Example 6 discloses microcapsules in which the polyurea shell wall is prepared using a blend of TETA and an epoxyamine adduct prepared by reacting TETA with diglycidyl ether of bisphenol A. The microcapsules of Example 6A were prepared using a 18:82 epoxy:TETA ratio, and the half-life of 15.7 days. The microcapsules of Example 6B were prepared using a 33.3:66.7 epoxy:TETA ratio, and the half-life was 9.5 days. The microcapsules of Example 6C were prepared using a 46:54 epoxy:TETA ratio, and the half-life was 5.8 days. From these data, the ordinarily skilled person can easily discern that increasing the epoxy content decreases the half life, while increasing the polyalkylamine content increases the half life.

The specification thus contains multiple examples of microcapsules having half lives within the claimed range.

Importantly, the microcapsules prepared in these examples employed three different combinations of amines.

Additionally, the specification describes the half life testing protocol in sufficient detail to enable the ordinarily skilled person to easily test whether other, non-disclosed microcapsule embodiments fall within the claim limitations at Example 1D, starting at paragraph [0170]. The ordinarily skilled person is thus not required to engage in any experimentation to determine how to measure half life. The ordinarily skilled person need only to carry out the test as described to determine if non-disclosed embodiments fall within the scope of the claims. Such testing is routine for someone with even a low skill level in the art.

The enablement requirement does not require limitation of the claims to the specific embodiment that the Office has pointed out in the Office Action. Stated another way, it is well-settled law that the claims are not required to exclude all non-enabled embodiments. That is, claims may read on enabled and non-enabled embodiments -- even a large number of non-enabled embodiments -- and still satisfy the enablement requirement. See *Atlas Powder Co. v. E.I. du Pont De Nemours & Co.*, 750 F.2d 1569, 1576-77 (Fed. Cir. 1984) (emphasis added):

> We agree with the district court's conclusion on enablement. ***Even if some of the claimed combinations were inoperative, the claims are not necessarily invalid. "It is not a function of the claims to specifically exclude ... possible inoperative substances...."*** *In re Dinh-Nguyen,* 492 F.2d 856, 858-59 (C.C.P.A. 1974) (emphasis omitted). *Accord, In re Geerdes,* 491 F.2d 1260, 1265 (C.C.P.A. 1974); *In re Anderson,* 471 F.2d 1237, 1242 (C.C.P.A. 1973). Of course, if the number of inoperative combinations becomes significant, and in effect forces one of ordinary skill in the art to experiment unduly in order to practice the claimed invention, the ***1577**

> claims might indeed be invalid. *See, e.g., In re Cook,* 439 F.2d 730, 735 (1971). That, however, has not been shown to be the case here.

See also *In re Vaeck*, 947 F.2d 488, 496 (Fed. Cir. 1991) (emphasis added):

> ***It is well settled that patent applicants are not required to disclose every species encompassed by their claims, even in an unpredictable art.*** *In re Angstadt,* 537 F.2d 498, 502-03 (C.C.P.A. 1976). However, there must be sufficient disclosure, either through illustrative examples or terminology, to teach those of ordinary skill how to make and how to use the invention as broadly as it is claimed. This means that the disclosure must adequately guide the art worker to determine, without undue experimentation, which species among all those encompassed by the claimed genus possess the disclosed utility.

See also *Application of Cook,* 439 F.2d 730, 735 (C.C.P.A. 1971) (emphasis added):

> However, many patented claims read on vast numbers of inoperative embodiments in the trivial sense that they can and do omit 'factors which must be presumed to be within the level of ordinary skill in the art,' In re Skrivan, 427 F.2d 801, 806, 57 CCPA 1201 (1970), and therefore read on embodiments in which such factors may be included in such a manner as to make the embodiments inoperative. There is nothing wrong with this so long as it would be obvious to one of ordinary skill in the relevant art how to include those factors in such manner as to make the embodiment operative rather than inoperative. Ibid. See also Goodman, op. cit. note 3 at 748, and Einhorn, op. cit. note 3 at 719.
>
> [. . .]
>
> ***We agree that appellants' claims are not too broad 'to the point of invalidity' just because they read on even a very large number of inoperative embodiments,*** since it seems to be conceded that a person skilled in the relevant art could determine which conceived but not-yet-fabricated embodiments would be inoperative . . . .

Thus, when considering whether claims are enabled, the case law clearly allows claims to cover non-enabled embodiments, even a very large number of inoperative embodiments. Applicants respectfully submit that even if the claims as pending (which have been narrowed substantially by defining the classes of amines considered "principal" and "auxiliary") encompass a large number of non-enabled embodiments, the claims satisfy the enablement requirement by showing several examples of microcapsules meeting the claim scope and including substantial guidance that would have allowed the ordinarily skilled person to modify the examples disclosed or surmise new amine combinations and easily determine through routine experimentation whether the microcapsules fall within the scope of the claims.

The Wands factors are often cited in the context of determining whether claims are enabled. These factors inform the determination of whether the amount of experimentation necessary to make and use the claimed invention may be considered "undue." Since the claims contain multiple examples and provide trend data, very little experimentation is actually necessary to make and use embodiments of the claimed invention meeting all of the claim limitations. For example, the trend data shown in FIGS. 1B and 2 and description in Example 6 provides sufficient guidance toward the preparation of microcapsules having a broad range of half lives, including non-disclosed embodiments. Nonetheless, the enablement analysis also requires consideration of whether the claims have a reasonable scope in view of the disclosures contained within the specification. In determining whether claims have a reasonable scope, the case law is very clear that experimentation -- even a

large quantity of experimentation -- is acceptable. See, e.g., *In re Wands*, 858 F.2d 731, 737 (Fed. Cir. 1988):

> ***Enablement is not precluded by the necessity for some experimentation*** . . . . The determination of what constitutes undue experimentation in a given case requires the application of a standard of reasonableness, having due regard for the nature of the invention and the state of the art. *Ansul Co. v. Uniroyal, Inc.* 448 F.2d 872, 878-79 (2d. Cir.1971), *cert. denied,* 404 U.S. 1018 (1972). The test is not merely quantitative, since a considerable amount of experimentation is permissible, if it is merely routine, or if the specification in question provides a reasonable amount of guidance with respect to the direction in which the experimentation should proceed.

See also *Go Med. Indus. Pty, Ltd. v. Inmed Corp.*, 300 F. Supp. 2d 1298, 1307 (N.D. Ga. 2003) (citing *In re Wands*, 858 F.2d at 736).

> "The Federal Circuit ***allows a considerable amount of experimentation*** so long as there is a reasonable amount of guidance."

The Declaration of David Z. Becher establishes that the specification and examples provide sufficient guidance enabling the skilled person to make and use the claimed invention and that the experimentation necessary to make non-disclosed microcapsules having the claimed half life range is not undue. Accordingly, the claims are fully enabled under the *Wands* factors analysis.

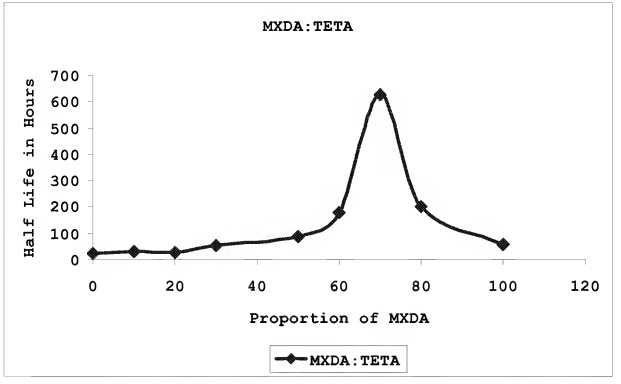
Factor 2) in the Wands analysis is the amount of direction provided by the specification. Factor 3) is the presence of absence of working examples. David Becher explains in paragraphs (4) through (8) of his Declaration that the specification provides not only numerous examples of microcapsules meeting the claimed half life limitation but also

includes trend data useful for guiding the ordinarily skilled person toward nondisclosed embodiments that meet the claim limitations:

(4) The specification and the examples provide a predictable and reliable method for selecting principal and auxiliary amines in order to prepare microcapsules having half lives within the claimed range. Examples 3A through 3I describe preparation of a series of microcapsules prepared using a blend of amines in varying amine ratios. The amine component comprised a blend of triethylene tetraamine ("TETA") and meta-xylene diamine ("MXDA"). In the context of the claims, this embodiment encompasses an auxiliary amine having an aryl moiety in combination with a principal amine comprising a linear polyalkylamine. The following table shows the relative proportions of the amines and the half lives of the resultant microcapsules prepared according to the methods described in these Examples:

Example	MXDA	TETA	Half Life in Hours	Half Life in Days
3I	100	0	57.84	2.41
3F	80	20	199.92	8.33
3E	70	30	626.4	26.1
3G	60	40	178.08	7.42
3D	50	50	88.8	3.7
3C	30	70	53.76	2.24
3B	20	80	25.92	1.08
3A	10	90	30	1.25
3H	0	100	24	1.00

(5) Below is a graphical depiction of the half-lives (in hours) as a function of the proportion of MXDA amine:



(6) In this embodiment, the half life of release appears to be strongly correlated to and thus predictable from the relative proportions of amine. The graph shows a trend that provides the ordinarily skilled person with the means to predict how varying the amine ratio affects the half life of release. Since the curve follows a substantially normal distribution, the ordinarily skilled person would be able to reliably predict that microcapsules prepared using a ratio of MXDA:TETA that is intermediate the ratios of any two contiguous data points would have a half life of release falling substantially on the normal distribution curve.

(7) The specification contains additional Examples of microcapsules prepared using a blend of amines. Certain of these examples have a half life of release falling within the claimed range of 5 to 100 days. Importantly, certain of these Examples, like Example 3, also disclose consistent trends that provide the ordinarily skilled person with ability to predict the effect of varying the types of amines and the amine ratios on half life of release. Example 1 discloses microcapsules in which the polyurea shell wall is prepared using a blend of Jeffamine EDR148 and

Jeffamine T403 in ratios of 60:40, 40:60, and 20:80. FIG. 1B shows a clear relationship between half life of release and the %equivalent of Jeffamine T-403 used in the amine blend. Example 4 discloses microcapsules in which the polyurea shell wall is prepared using a blend of Jeffamine T403 and TETA in a ratio of 0:100 (Example 4A), 90:10 (Example 4B), and 50:50 (Example 4C). In the context of the claims, this embodiment encompasses an auxiliary amine comprising an epoxy-amine adduct in combination with a principal amine comprising a linear polyalkylamine. As shown in FIGS. 4A and 4B, the microcapsules of Examples 4B and 4C, prepared using the amine blend, exhibited superior control against wheat, wild oat, and green foxtail compared to the microcapsules of Example 4A, which were prepared using one amine. Example 6 discloses microcapsules in which the polyurea shell wall is prepared using a blend of TETA and an epoxyamine adduct prepared by reacting TETA with diglycidyl ether of bisphenol A. The TETA was added in excess in each of Examples 6A, 6B, and 6C. The amines of some of the TETA reacted with the diglycidyl ether of bisphenol A to form the epoxy-amine adduct. Since excess TETA remained in reaction solution, the amine blend comprised the product epoxy-amine adduct and TETA. In the context of the claims, this embodiment encompasses an auxiliary amine comprising an epoxy-amine adduct in combination with a principal amine comprising a linear polyalkylamine. The specification provides guidance at paragraph [0236] that epoxy-amine adducts prepared from diglycidyl ether of bisphenol A increase release rates while epoxy-amine adducts prepared from phenolic resins decrease release rates. The microcapsules of Example 6A were prepared using a 18:82 epoxy:TETA ratio, and the half-life of 15.7 days. The microcapsules of Example 6B were prepared using a 33.3:66.7 epoxy:TETA ratio, and the half-life was 9.5 days. The microcapsules of Example 6C were prepared using a 46:54 epoxy:TETA ratio, and the half-life was 5.8 days. The specification thus contains multiple examples of microcapsules having half lives within the claimed range. Examples 1, 3, and 6 additionally disclose trends that the ordinarily skilled person could use to determine appropriate amines for preparing microcapsules and appropriate amine ratios to reach desired half lives of release.

Factor 1) in the Wands analysis is quantity of experimentation necessary to prepare other embodiments meeting the claim limitations. In view of the multiple examples, David Becher explains that the quantity of experimentation is not excessive in this art. David Becher also explains that the specification enables those of relatively low level of skill (Wands factor 6) in this art to determine whether microcapsules fall within the claim limitations:

> **(8)** In view of the multiple examples describing microcapsules having half lives of release within the claimed range and the examples showing trend data, the amount of experimentation the ordinarily skilled person must conduct in order to prepare microcapsules having half lives within the claimed range is not excessive. ***Additionally, the type of experimentation is routine in the field of encapsulating materials.*** The specification describes at Example 1D paragraph [0170] in sufficient detail the test for determining the half life of a population of microcapsules. The ordinarily skilled person thus does not have to do any substantial experimentation in order to determine if a population of microcapsules has a half life within the claimed range since the half life determination test is provided. ***A technician having an associate's degree or a sound high school education would be capable of carrying out the half life determination technique.*** I would also characterize the type of experimentation necessary to determine if other amine blends yield microcapsules having half lives within the claimed range as routine. The specification provides multiple examples of microcapsules having half lives within the claimed range. The specification provides multiple examples of the types of amines that can be used in a two amine blend in order to prepare microcapsules having half lives within the claimed range. The specification provides trend data showing how half life of release can be varied by the ratio of amines. Based on the variety of amines used in the examples, the ordinarily skilled person can easily predict if amines having somewhat different but closely related structures are potentially useful in preparing microcapsules having

half lives within the claimed range. The ordinarily skilled person can, through routine experimentation, easily prepare a series of microcapsules having varying ratios of two amines, like the series shown in Examples 3A through 3I in Table 1. The ordinarily skilled person can easily determine, through routine experimentation, if a series of amine ratios will show the type of strong correlation between amine ratio and half life like the series of microcapsules of Examples 3A through 3I.

(9) The Office Action states "The relative skill of those in the art is high, that of a PhD." I agree that there are certainly researchers in the field of encapsulating materials with polymeric shellwall materials that are highly skilled. However, the amount of skill necessary to prepare microcapsules within the boundaries of the claims is not necessarily someone with a PhD. In view of the extensive guidance provided by the specification and working examples, the specific examples of amines used to prepare microcapsules meeting all of the claim limitations, and the trend data, ***a person having lower skill in the art could readily prepare microcapsules within the scope of the claims***.

With respect to Wands factor 5) and 7), David Becher states at paragraph (10): "The state of the art was unpredictable before the discovery and disclosure of the subject matter of the present application." Becher's Declaration establishes at paragraph (19) that the present invention is a significant contribution toward eliminating the amount of unpredictability in the field:

(10) In view of the unpredictable nature of the Seitz et al.'s microcapsules and the lack of half life data in Becher et al.'s disclosure, it is my view that the ordinarily skilled person would not have been able to predict that the use of amine blends would have enabled the preparation of microcapsules having finely tunable half lives of release within the claimed range. ***The discovery of such a robust relationship between amine ratio and half life is therefore a***

significant contribution toward eliminating much of the unpredictability in this field that existed before the disclosure of the present application.

The specification, the case law, and the Wands factors analysis clearly favor the conclusion that the claims satisfy the enablement requirement. Applicants respectfully request the rejection be withdrawn.

IV. Claim Rejections Under 35 U.S.C. §103(a)

Reconsideration is requested of the rejection of claims 1-5, 9-12, 17-36, 40-43, and 48-69 as being unpatentable over Seitz et al. (U.S. 5,925,595), alone or in combination with Becher et al. (U.S. 4,563,212).

Claim 1 is directed to a pesticidal material comprising a substantially water-immiscible core material, the core material comprising a pesticide and being encapsulated in a shell having a predetermined permeability with respect to the core material, wherein:

-- the core material is a single phase liquid at 50°C,

-- the predominant release mechanism of core material from the microcapsule is molecular diffusion of the core material through the shell wall,

-- further wherein the shell of the microcapsule is formed by an interfacial polymerization of a polyisocyanate with other monomers in an encapsulation shell-forming polymerization system, said other monomers comprising a principal amine and an auxiliary amine, and

-- further wherein the microcapsule has a release rate which is characterized by a half-life ranging from about 5 days to about 100 days, the half-life being calculated from a measured release of pesticide over time from a population

of microcapsules immersed in water at a temperature of about 30°C;

-- further wherein the auxiliary amine comprises an epoxy-amine adduct, a polyetheramine, or an amine comprising a moiety selected from the group consisting of an aryl moiety and a cycloalkyl moiety; and

-- the principal amine comprises a linear polyalkylamine or an epoxy-amine adduct.

Independent claims 24, 25, 32, 55, and 56 contain similar requirements. The pesticidal material defined by claims 1, 24, 25, and 32 and the agricultural formulation of claims 55 and 56 thus requires the shell wall of the microcapsule be prepared by reacting a polyisocyanate and a blend of a principal amine and an auxiliary amine. As amended herein, the classes of amines that may be auxiliary amines and the classes of amines that may be principal amines have been further clarified. Accordingly, the combinations of principal amines and auxiliary amines are limited by the definition of each type of amine.

Seitz et al. disclose a method of producing a microencapsulated pesticide. The pesticide is encapsulated in a polyurea shell wall prepared from three components: (1) a trifunctional adduct of a linear aliphatic isocyanate, (2) an aliphatic linear diisocyanate, and (3) a polyamine. The rate of release of core material through the spherical shell wall is stated to be directly proportional to the relative amounts of the trifunctional adduct of a linear aliphatic isocyanate and the aliphatic linear diisocyanate.

Seitz et al. do not disclose or suggest using more than one amine to prepare their microencapsulated pesticide nor do they disclose any exemplary formulations containing more than one

polyamine, nor would their disclosure have caused the ordinarily skilled person to modify Seitz et al. in order to meet each of the claim elements. Additionally, Seitz et al. neither disclose nor suggest the claimed requirement for interfacial polymerization using a principal amine selected from the classes required by the claims and an auxiliary amine from the classes required by the claims.

Seitz et al. disclose amines useful for reacting with the trifunctional adduct of a linear aliphatic isocyanate and the aliphatic linear diisocyanate at Col. 8, lines 1-8. They are stated to be "expected to function adequately." The polyamine is added to the composition in order to react with the isocyanate components to form the desired polyurea and to avoid the undesired hydrolysis of the isocyanate. Seitz et al. do not disclose or suggest using more than one amine to prepare their microencapsulated pesticide nor do they disclose any exemplary formulations containing more than one polyamine. Rather, Seitz et al. disclose only the use of triethylenetetraamine or diethyleenetetraamine, and each amine is used alone.

Moreover, a statement that the amines that Seitz et al. suggest using are "expected to function adequately" is not a disclosure or suggestion of multiplying the number of amine species. It merely suggests that each of the amines in the list is functional and thus one may be substituted for another. It is not a suggestion of the very different idea of using two or more amines, which is the inventive concept that applicants have discovered and now claim. It is certainly not a suggestion that certain amine classes qualify as auxiliary amines to be used in combination with certain classes of principal amines.

Thus, Seitz et al. fail to disclose the particular combinations of amines that flow from the definitions of

auxiliary amine and principal amine in the claims. Seitz et al. merely list amines that are expected to function adequately, but they neither disclose nor suggest any combination falling within the scope of the claims nor would the ordinarily skilled person have found any reason whatsoever to duplicate amines given Seitz et al.'s disclosure.

Given the lack of any suggestion of amine multiplication in Seitz et al. and the lack of any suggestion of the amine combinations that flow from the definitions of auxiliary and principal amines, the obviousness rejection is also based on Becher et al., which includes a claim 13 directed to:

> A process according to claim 11 wherein said first shell wall component is a diisocyanate and said second shell wall component is a polyfunctional amine or a mixture of polyfunctional and difunctional amines.

Becher et al. thus discloses a claim in which the second shell wall component is optionally a mixture of polyfunctional and difunctional amines. Becher et al.'s amines are disclosed at Col. 7, lines 39-53. Although Becher et al. disclose and claim an embodiment in which a mixture of amines is used, Becher et al., like Seitz et al., fail to disclose or suggest the possible combinations of amines that flow from the claimed definitions of the classes of amines that qualify as auxiliary amines and principal amines.

Becher et al., like Seitz et al., is notably deficient for failing to provide a reason for selecting a mixture of amines. Even though Becher et al. claim a mixture of amines, neither the specification nor the examples provides any reason to use a mixture of amines. None of Becher et al.'s examples employ a mixture of amines. The only amine used in each of Becher et al.'s examples (that employ amines) is the linear diamine, 1,6-

hexamethylenediamine. Becher et al. disclose reasons for using a mixture of molecules having different types of organic functional groups of shell wall components at Col. 6, lines 32-45. For example, an amine and a diol may be used as second shell wall components in combination with acyl chlorides to make mixed polyester/polyamide shell wall. Also, an amine may be used in combination with isocyanate and acyl chloride shell wall components to make mixed polyamide/polyurea shell wall. A suggestion to use different types of shell wall components to prepare mixed shell walls is not a suggestion to duplicate amines. If anything, the ordinarily skilled person would have concluded that duplicating amines is pointless redundancy since such duplication does not result in different types of shell wall polymers.

It is thus abundantly clear that the references, alone or in combination, do not disclose or fairly suggest the mixtures of amines that are defined by the claims, nor do theses references provide any reason why such a combination is desirable. The Declaration of David Becher reinforces that the combined disclosures of the cited references would not have given the ordinarily skilled person any reason to employ the two amine combinations required by the claims and would not have given the ordinarily skilled person even the slightest ability to predict that the amines defined by the claims would be useful in the preparation of microcapsules having highly controllable half lives within the claimed range.

Before turning to the Declaration of David Becher, it should be noted that there is a very clear and obvious tension between the Office's assertion that the microcapsule art is unpredictable and thus the claims are not enabled and the additional assertion that the disclosures of the cited

references would have given the ordinarily skilled person the ability to predict that using amine combinations would have provided the unexpected advantages present in applicants' invention. The Office's basis for the lack of enablement is the high degree of unpredictability in the art. The Office bases lack of enablement at least in part on statements such as, on page 6, "That factor is outweighed, however, ***by the unpredictable nature of the art*** of pesticidal microcapsules." And on page 7, "Because of the ***known unpredictability*** of the art, ..." The Office thus admits that the nature of this art is unpredictable. The applicants agree that, prior to the invention and disclosure of the present application, the nature of the art was unpredictable with respect to control of the half lives. In addition, if it is the Office's view that the art was unpredictable even with the applicants' contributions, the art must have had an even higher level of unpredictability prior to applicants' invention, which David Becher explains has significantly reduced unpredictability in the microcapsule field.

Yet, despite this admitted unpredictability, the Office also asserts that pesticidal materials satisfying all of the claim requirements would have been obvious by stating, for example, on page 10 of the Office Action, "it would have been obvious to a person having ordinary skilled in the art...to form the microencapsulated composition...with a reasonable expectation of success. It is generally *prima facie* obvious to combine prior art elements according to known methods to yield ***predictable results***." The Office's bases for non-enablement and obviousness are mutually exclusive: the Office admits that the art is unpredictable, yet the Office asserts that combinations

of amines that are not disclosed anywhere in the art yield predictable results.

Seitz et al. do not disclose any amine combinations and thus does not provide any data regarding the resultant microcapsules. Becher et al., while disclosing and claiming a mixture of amines, does not actually disclose any amine combinations, does not disclose any examples using amine combinations, and thus does not provide any characterization data of microcapsules prepared using a combination of amines. Since the prior art does not disclose any microcapsules meeting all of the claim limitations, does not provide any reason to prepare such microcapsules meeting all of the claim limitations, and does not provide even the slightest basis for predicting that microcapsules meeting the claimed limitations have highly tunable and predictable half lives, there is no basis for the Office's assertion that the advantageous properties of the microcapsules of the claims would have been predictable. This is a particularly glaring deficiency in the Office's *prima facie* case in view of the Office's admission that this is an unpredictable art.

The Declaration of David Becher establishes that the art was unpredictable ***prior to*** the invention and disclosure of the present invention and that the present invention represents a significant contribution that substantially reduces the unpredictability in the field:

> **(19)** In view of the unpredictable nature of the Seitz et al.'s microcapsules and the lack of half life data in Becher et al.'s disclosure, it is my view that the ordinarily skilled person would not have been able to predict that the use of amine blends would have enabled the preparation of microcapsules having finely tunable half lives of release within the claimed range. ***The discovery of such a robust relationship***

between amine ratio and half life is therefore a significant contribution toward eliminating much of the unpredictability in this field that existed before the disclosure of the present application.

The Declarative evidence thus shows that the applicants' contribution to the art of microcapsule preparation is significant and non-obvious in view of the unpredictable nature of the art that existed before the present invention. Thus, the Office is correct in asserting that the art was unpredictable prior to applicants' invention. This admission serves to underscore the non-obviousness of the claims. Applicants' invention is a significant contribution to the field since the robust relationship between amine ratio and half life significantly reduces the unpredictability in the field and provides an important method for tuning half life of release of microencapsulated materials.

The Declarative evidence and the Office's own admissions further establish that the Office cannot base *prima facie* obviousness on assertions of predictability, as in the statement, "It is generally *prima facie* obvious to combine prior art elements according to known methods to yield ***predictable results.*** See MPEP 2141 III(A)." In the first place, the Office has admitted that the art was unpredictable prior to applicants' invention. The Office's assertion that the results would have been unpredictable is unsupportable under ***the Office's own standards.***

The Office's assertions cannot support obviousness under the standards set forth in MPEP §2143 Part A., which sets out the requirements the Office must show to support *prima facie* obviousness based on predictable results:

A. Combining Prior Art Elements According to Known Methods To Yield Predictable Results

To reject a claim based on this rationale, Office personnel must resolve the *Graham* factual inquiries. Then, Office personnel must articulate the following:

(1) a finding that ***the prior art included each element claimed***, although not necessarily in a single prior art reference, with the only difference between the claimed invention and the prior art being the lack of actual combination of the elements in a single prior art reference;

(2) a finding that one of ordinary skill in the art could have combined the elements as claimed by known methods, and that in combination, each element merely performs the same function as it does separately;

(3) a finding that one of ordinary skill in the art ***would have recognized*** that the results of the combination ***were predictable***; and

(4) whatever additional findings based on the *Graham* factual inquiries may be necessary, in view of the facts of the case under consideration, to explain a conclusion of obviousness.

If these conditions are not met, the Office's rationale cannot support *prima facie* obviousness, and the rejection should be withdrawn. The cited Seitz et al. reference fails to meet the first condition required by MPEP §2143 Part A. since the Seitz et al. reference does not include "each element claimed," in particular, the use of both a principal amine and an auxiliary amine to prepare the microcapsule shell wall, and in particular the specific classes of amines that qualify as auxiliary amines and principal amines. Seitz et al.'s failure to disclose or suggest multiple amines means that their disclosure fails to meet the first condition of MPEP §2143 Part A. Becher et al.'s disclosure fails to meet the first condition as well. Even

though Becher et al. disclose and claim a mixture of amines, Becher et al. do not disclose or suggest the specific types of amines that qualify as auxiliary amines and the specific types of amines that qualify as principal amines and thus fails to disclose or suggest the combinations of amines that flow from these definitions.

With regard to the third condition, the ordinarily skilled person could not have recognized or predicted the advantageous results of the present invention in terms of control of half lives that is enabled by using the amines defined by the claims to prepare the microcapsules. The Office has admitted that the art was unpredictable at least prior to applicants' invention. The applicants agree and accept the Office's admission that the nature of the art was unpredictable prior to applicants' present invention. In view of the unpredictability that was existed in the art before applicants' invention, the present invention is, as established by Becher, a significant, non-obvious achievement that significantly reduces or eliminates much of the unpredictability of the field. Obviousness is judged based on the nature of the field at the time of the invention and cannot take the disclosures of the patent application into account when determining what is predictable to the ordinarily skilled person. In this regard, the Seitz et al. and Becher et al. disclosures would not have enabled the ordinarily skilled person to predict the results achieved by the applicants in terms of the ability to control the half life of release via the manipulation of the amines selected as auxiliary and principal amines since neither reference discloses any combination that meets the limitations of the claims.

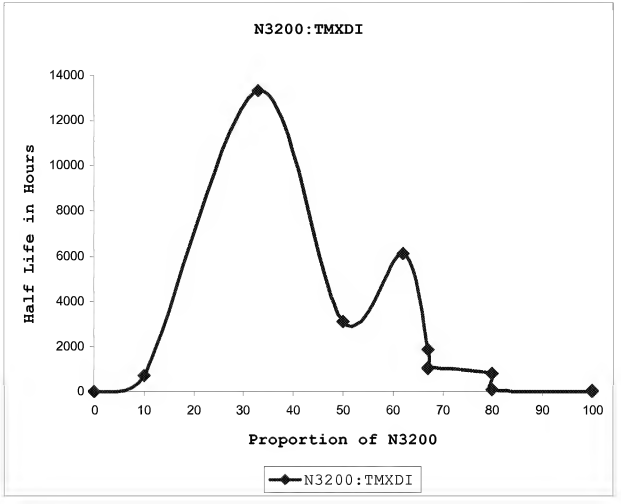
The Becher Declaration at paragraphs (10)-(13) explains the deficiencies of the Seitz et al. disclosure in terms of the

erratic results achieved when attempting to tune half lives by varying isocyanate ratios:

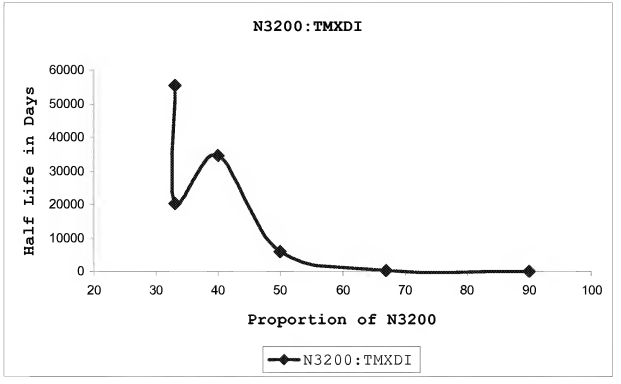
(10) ***The state of the art was unpredictable before the discovery and disclosure of the subject matter of the present application. The cited Seitz et al. application illustrates the highly unpredictable nature of the art.*** Seitz et al. disclose the use of and manipulation of a pair of isocyanates for the preparation of controlled release microcapsules. Seitz et al. prepared microcapsules using a blend of the polyisocyanates Desmodur N3200 ("N3200" in Tables 1 and 2) and meta-tetramethylxylylene ("TMXDI" in Tables 1 and 2) in varying proportions. The microcapsules of Examples 1-6 and 13-18 were prepared using triethylene tetraamine ("TETA" in Table 1). The following table shows the relative proportions of polyisocyanate and the half lives of the resultant microcapsules prepared according to the methods described in these Examples:

Example	N3200	TMXDI	Half Life in Hours	Half Life in Days
5	100	0	26	1.0833
15	100	0	4	0.166
14	80	20	72	3
17	80	20	816	34
1	67	33	1080	45
13	67	33	1008	42
16	67	33	1848	77
18	62	38	6096	254
2	50	50	3120	130
3	33	67	13320	555
4	10	90	696	29
6	0	100	20	0.8333

(11) Below is a graphical depiction of these half-lives (in hours) as a function of the proportion of N3200 polyisocyanate:



(12) The microcapsules of Seitz et al.'s Examples 7-12 were prepared using the same blend of polyisocyanates with triethylene tetraamine ("DETA" in Table 1) instead of TETA. All of the half lives were very long, except for Example 11, which had a half life of three days. Below is a graphical depiction of the half-lives (in days) as a function of the proportion of N3200 polyisocyanate:



(13) In each graph of the Seitz et al. data, the relationship between proportions of isocyanate monomers and half life is erratic, volatile, and unreliable. The lines connecting the points on each graph show that the distribution of half lives is not a normal distribution. Thus, the lines do not define any sort of clear correlation between two contiguous points or among the entire set of data points on the graph. The ordinarily skilled person would not be able to predict that microcapsules prepared using a ratio of isocyanates intermediate the ratios of two contiguous data points would have a half life of release intermediate the two contiguous data points. The erratic nature of the data precludes such predictability.

Since Seitz et al.'s results were so erratic and unpredictable when varying isocyanate ratios, the ordinarily skilled person, having knowledge that the field is unpredictable, could not have been able to predict that using a combination of amines results in the preparation of

microcapsules whose half lives can be finely controlled. Applicants' achievement is therefore patentably significant since they have discovered and disclosed a robust relationship between half life and amine ratio that was unpredictably in view of the prior art.

The applicants' achievement in discovering that a blend of amines used to prepare a microcapsule shell wall leads to fine tunability of the half life of release cannot be undercut by the mere observation that some of Seitz et al.'s microcapsules have half lives falling within the claimed range. Importantly, the Seitz et al. microcapsules were prepared using a blend of isocyanates and not using a combination of auxiliary and principal amines as they are defined by the claims. The Seitz et al. microcapsules thus differ in structure than the microcapsules of the claims and there is nothing in Seitz et al. or Becher et al. that would have enabled the ordinarily skilled person to draw any conclusions from Seitz et al.'s data about the properties of the microcapsules of the claims.

Additionally, the argument is not that the present claims are inventive merely because of the half life limitation. It is recognized that at least some combinations of isocyanates would result in microcapsules having half lives within the claimed range. Nonobviousness and patentability of the present claims is predicated on the non-disclosed combinations of two amines as they are defined by the claims and the unexpected advantage that using a blend of amines results in microcapsules having such finely controlled half lives. Thus, the unpredictable advantage of the present invention is that the ordinarily skilled person is armed with the ability to finely control the change in half life that results from a variation in the ratio of amines. This predictability and tunability is entirely absent from Seitz

et al.'s microcapsules. The graphs shown above of Seitz et al.'s data do not provide the ordinarily skilled person with the ability to predict how varying the ratio of isocyanates might affect the half life of the resultant particles since the change in half life does not follow anything resembling a normal distribution. Since Seitz et al.'s microcapsules are different in terms of composition, since the art was so unpredictable, and since the change in half life is so erratic, the ordinarily skilled person would not have been able to predict that using a combination of amines and varying the ratio of amines results in microcapsules having such finely tunable half lives.

Additionally, as explained by David Becher, Seitz et al. define other variables as affecting release rates, and none of these variables include the identity of amines, much less a combination of amines as defined in the claims:

> **(14)** Seitz et al. nominate five variables as affecting release rates: (1) permeability of the shell wall as controlled by the ratio of isocyanates at Col. 4, line 64 to Col. 5, line 12, (2) wall thickness at Col. 1, lines 53-62, (3) nature of the active, or mixture thereof with, e.g., a safener at Col. 4, lines 21-32, (4) selection of solvent at Col. 5, lines 29-37, and (5) temperature at Col. 20, lines 1-17. All these variables have been nominated by Seitz et al. as affecting the permeability of the shell wall. No such significance is placed on the amines, and no suggestion is made that a blend of amines may be useful for predictably controlling the half life of microcapsules by varying the principal to auxiliary amine ratio and thereby avoiding the effect of the erratic, volatile, and unreliable relationship between the isocyanate ratio and the half life of release. Rather, Seitz et al. merely recognized that all the amines that were listed in their disclosure have the same function, which was to react with the isocyanate functionality present on the isocyanate molecules. Seitz et al. further enabled the ordinarily skilled person to predict that each of

these individual amines would function adequately. However, Seitz et al.'s disclosure and data would not have made it predictable that the use of a primary amine and an auxiliary amine at varying ratios would provide superior control of the release rate. In contrast to the graphical presentations of the Seitz et al. data, the half life release values for the formulations of the present invention are smoothly and reliably correlated to the relative proportions of principal and auxiliary amines, and the half lives fall in a useful range over wide ranges of relative proportions, as shown in the chart on page 29 and the graph on page 30 in the Response to the August 27, 2009 Final Office Action. In reviewing the various graphical presentations of data in that Response, it is critical to note that the half lives are given in hours and the scale extends to just 700 hours in the graph plotting the applicants' compositions on page 30, while the scale extends to 60,000 *days* in the graph plotting Seitz et al.'s compositions on page 28. 60,000 days is 1,440,000 hours. Accordingly, the scale of the graph on page 28 is over 2000x the scale of the graph on page 30. The scale of the graph on page 27 is to 14,000 hours, which is still 20x the scale of the graph on page 30.

(15) It is important to keep these differences in scale in mind if one is to compare the Seitz et al. data with the half lives of release obtained from the microcapsules of the present application, which were prepared using a blend of a principal amine and an auxiliary amine. The data are directly comparable since the difference between the half lives and their reproducibility result basing half life control on a combination of different polyisocyanates rather than a combination of different polyamines. A comparison of these data yields the following conclusions, among others, regarding the exceedingly and unexpectedly superior control of half life of release obtained by using a blend of amines over a blend of polyisocyanates:

(16) First, the half lives of release of the Seitz et al. examples vary widely with relatively minor changes in the relative proportions of the polyisocyanates. Compare this to the half lives of release of the present application's examples, which

show a consistent relationship to composition and avoid the drastic sensitivity to small increments of change in relative proportions that characterize the polyisocyanates. Nothing in Seitz et al.'s disclosure would have given the ordinarily skilled person the ability to predict that the half life of release could be so reliably controlled by varying the relative proportion of the amines in a polyamine blend. This is thus one unexpected benefit of using a principal amine and an auxiliary amine to prepare the microcapsule shell wall.

(17) Second, many of the half lives of release of the Seitz et al. examples are excessively long and thereby result in commercially impractical pesticidal materials. Some of the examples had measured half lives on the order of *years* (e.g., 16 years, 56 years, and even 95 years for Seitz et al.'s examples 8-10).[1] The data show that only minor variations in the relative ratio of polyisocyanates can alter the release rate characteristics widely from short half lives to exceedingly long half lives. Only a select window of polyisocyanate proportions yields microcapsule release rates of commercially acceptable durations using Seitz et al.'s method. Given the steep rate of change in half life versus isocyanate ratio, one skilled in the art would have very little confidence that the acceptable window would be reproducible. In the present application, the entire range of polyamine blends yield commercially useful microcapsule release rates. For example, over the entire range of relative proportions of amines, the half life varies from about 1 day to about 26 days. Significantly, modest variation in amine ratio does not throw the release rate out of control. Depending upon soil conditions, climate, the crop, the types of weeds that may be present, etc., a commercial use may be found for each and every example of the inventive pesticidal material. This contrasts sharply with Seitz et al., whose examples show only a few of the microcapsules (e.g., some of the microcapsules having less than 10% N3200 or greater than 80% N3200) have half lives of comparable duration, and the extreme sensitivity of half life to small changes in proportions makes quality control difficult, if not impossible. Nothing in Seitz et al.'s disclosure would have given the ordinarily skilled person the

> ability to predict that the entire range of relative proportions of the amines in a polyamine blend yield commercially viable pesticidal materials while only select, narrow and potentially unstable windows of proportions of isocyanates result in commercially viable controlled release materials using the Seitz et al. method. Therefore, this is another unexpected benefit of using a principal amine and an auxiliary amine to prepare the microcapsule shell wall.

Thus, there is nothing in Seitz et al.'s disclosure that would have allowed the ordinarily skilled person to predict that using a combination of amines results in microcapsules having finely tunable half lives.

Becher et al.'s disclosure does not cure the deficiencies in Seitz et al. and does not provide the ordinarily skilled person with any ability to predict that combinations of amines results in microcapsules having tunable half lives. See paragraph (18) of Becher's Declaration:

> **(18)** The cited Becher et al. reference contains a claim requiring the use of two amines. This appears to be the extent of any disclosure of two amine blends. The reference does not contain any examples of microcapsules using two amines. The reference does not suggest combinations of classes of amines and thus does not disclose the various combinations required by the claims. This reference does not provide any half life data whatsoever, much less the half life of microcapsules prepared using a blend of amines within the classes required by the claims.

The claims are thus patentable since the invention represents a significant, non-obvious step toward reducing the unpredictability in the art and arms the ordinarily skilled person with a robust method for fine tuning the half lives of controlled release microcapsules. These advantages would not have been apparent to the ordinarily skilled person having the

benefit of Seitz et al. and Becher et al. since neither of these references disclose or even suggest the combinations of amines required by the claims. Therefore, the combination of references does not render the claims obvious, and the rejection should be withdrawn.

With respect to claims 9, 22, 28, 29, 53 which require a difference in the between the respective Hildebrand solubility parameters of the core material and shell, these claims are further patentable since Seitz et al. and Becher et al. neither disclose nor suggest how employing a principal amine and an auxiliary amine to prepare the shell wall would affect the overall solubility of the core material in the shell wall. Rather, applicants discovered and disclosed that the solubility of the core material in the shell wall may be determined by, for example, calculating the Hildebrand solubility parameter and correlating that parameter to the relative ratios of a principal amine and an auxiliary amine used to prepare the shell wall polymer, as discussed in applicants' specification at paragraphs [0077] to [0081], and in particular, paragraph [0079].

CONCLUSION

In view of the foregoing, applicants request allowance of all claims. The Commissioner is hereby authorized to charge the fee for a three-month extension of time and charge any underpayment or credit any overpayment of required fees regarding this Response to Deposit Account No. 19-1345.

Respectfully submitted,

/Nicholas A. Keppel/

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NAK/mrt

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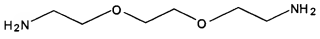
Technical Bulletin

JEFFAMINE® EDR-148 Polyetheramine (XTJ-504)

JEFFAMINE EDR-148 polyetheramine is a symmetrical, unhindered diamine. Like other JEFFAMINE polyetheramines, it imparts flexibility and toughness to thermoset polymers. However, JEFFAMINE EDR-148 polyetheramine is unique in that it is much more reactive than the JEFFAMINE D, T, and ED series amines.



APPLICATIONS
- Epoxy curing agent
- Monomer for polyamides

BENEFITS
- Can be formulated to cure at room temperature
- Rapid cure at elevated temperatures
- Excellent thermal shock resistance in cured epoxies

SALES SPECIFICATIONS

Property	Specifications	Test Method*
Appearance	Colorless to light yellow with slight haze	ST-30.1
Color, Pt-Co	50 max.	ST-30.12
TEGDA, area% (Triethyleneglycol diamine)	98 min.	ST-35.143
Total amine, meq/g	12.7 min.	ST-5.35
Water, wt%	0.35 max.	ST-31.53, 6

*Methods of Test are available from Huntsman Corporation upon request.

ADDITIONAL INFORMATION

Regulatory Information

DOT/TDG Classification	Amines, liquids, corrosive, N.O.S. (triethyleneglycol diamine)
HMIS Code	3-1-0
CAS Number	929-59-9
US, TSCA	Listed
Canadian WHMIS Classification	D2B, E
Canada, DSL	Not Listed
European Union, EINECS/ELINCS	Listed
Australia, AICS	Listed
Japan, ENCS	Listed
Korea, ECL	Listed
China, IECSC	Not Listed

Typical Physical Properties

AHEW (Amine hydrogen equivalent wt.), g/eq	37
Viscosity, cSt, 25°C (77°F)	8
Density, g/ml (lb/gal), 25°C	0.998 (8.32)
Flash point, PMCC, °C (°F)	129 (265)
pH	11.6

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TOXICITY AND SAFETY

For additional information on the toxicity and safe handling of this product, consult the Material Safety Data Sheet (Safety Data Sheet in Europe) prior to use of this product.

HANDLING AND STORAGE

Materials of Construction

At temperatures of 75-100°F (34-38°C)

Tanks	Carbon steel
Lines, valves	Carbon steel
Pumps	Carbon steel
Heat exchange Surfaces	Stainless steel
Hoses	Stainless steel, polyethylene, polypropylene, and TEFLON®[1]
Gaskets, packing	Polypropylene or TEFLON®[1] (elastomers such as neoprene, Buna N, and VITON®[1] should be avoided)
Atmosphere	Nitrogen or dry air

At temperatures above 100°F (38°C)

Tanks	Stainless steel or aluminum
Lines, Valves	Stainless steel
Pumps	Stainless steel or Carpenter 20 equivalent
Atmosphere	Nitrogen

[1] Registered trademark of Dupont

JEFFAMINE® EDR-148 polyetheramine may be stored under air at ambient temperatures for extended periods. A nitrogen blanket is suggested for all storage, however, to reduce the effect of accidental exposure to high temperatures and to reduce the absorption of atmospheric moisture and carbon dioxide. It should be noted that pronounced discoloration is likely to occur at temperatures above 140°F (60°C), whatever the gaseous pad.

Cleanout of lines and equipment containing JEFFAMINE EDR-148 polyetheramine can be accomplished using warm water and steam. In the event of spillage of this product, the area may be flushed with water. The proper method for disposal of waste material is by incineration with strict observance of all federal, state, and local regulations.

AVAILABILITY

Samples are available in North America and Asia by contacting our sample department at 1-800-662-0924. Samples in other locations, including Europe, are available by contacting any Huntsman Corporation sales office.

JAEDR148-0407

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Technical Service US: 8600 Gosling Road / The Woodlands, Texas 77381 / 281-719-7760

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Technical Service Europe: Technical Services Representative / Everberg Office / 32-2-758-9302

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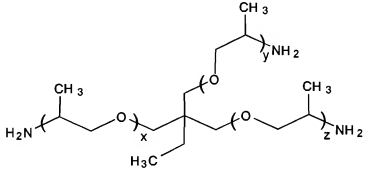
Technical Bulletin

JEFFAMINE® T-403 Polyetheramine

JEFFAMINE T-**403** polyetheramine is is characterized by repeating oxypropylene units in the backbone. As shown by the structure, JEFFAMINE T-403 is a trifunctional primary amine having an average molecular weight of approximately 440. Its amine groups are located on secondary carbon atoms at the ends of aliphatic polyether chains.



(x+y+z) = 5-6

APPLICATIONS
- Epoxy curing agent
- Anti-sag agent for polyurethanes

BENEFITS
- Low color and vapor pressure
- Completely miscible with a wide variety of solvents, including water
- Improves flexibility and strength

SALES SPECIFICATIONS

Property	Specifications	Test Method*
Appearance	Colorless to pale yellow with slight haze	ST-30.1
Color, Pt-Co	50 max.	ST-30.12
Primary amine, % of total amine	90 min.	ST-5.34
Total acetylatables, meq/g	6.5 min. – 7.1 max.	ST-31.39
Total amine, meq/g	6.1 min. – 6.6 max.	ST-5.35
Water, wt%	0.25 max.	ST-31.53, 6

*Methods of Test are available from Huntsman Corporation upon request.

ADDITIONAL INFORMATION

Regulatory Information	
DOT/TDG Classification	Corrosive liquids, toxic, N.O.S. (polyoxypropylenetriamine)
HMIS Code	3-1-0
CAS Number	39423-51-3
US, TSCA	Listed
Canadian WHMIS Classification	D1B, E
Canada, DSL	Listed
European Union, EINECS/ELINCS	Polymer Exempt
Australia, AICS	Listed
Japan, ENCS	Contact Huntsman Regulatory
Korea, ECL	Listed
China, IECSC	Listed

Typical Physical Properties	
AHEW (amine hydrogen equivalent wt.), g/eq	81
Viscosity, cSt, 25°C (77°F)	72
Density, g/ml (lb/gal), 25°C	0.978 (8.12)
Flash point, PMCC, °C (°F)	196 (385)
pH, 5% aqueous solution	11.6
Refractive index, n_D^{20}	1.46
Vapor Pressure, mmHg/°C	1/181
	5/207

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TOXICITY AND SAFETY

For additional information on the toxicity and safe handling of this product, consult the Material Safety Data Sheet (Safety Data Sheet in Europe) prior to use of this product.

HANDLING AND STORAGE

Materials of Construction

At temperatures of 75-100°F (34-38°C)

Tanks	Carbon steel
Lines, valves	Carbon steel
Pumps	Carbon steel
Heat exchange Surfaces	Stainless steel
Hoses	Stainless steel, polyethylene, polypropylene, and TEFLON®
Gaskets, packing	Polypropylene or TEFLON® (elastomers such as neoprene, Buna N, and VITON® should be avoided)
Atmosphere	Nitrogen or dry air

At temperatures above 100°F (38°C)

Tanks	Stainless steel or aluminum
Lines, Valves	Stainless steel
Pumps	Stainless steel or Carpenter 20 equivalent
Atmosphere	Nitrogen

JEFFAMINE® T-403 polyetheramine may be stored under air at ambient temperatures for extended periods. A nitrogen blanket is suggested for all storage, however, to reduce the effect of accidental exposure to high temperatures and to reduce the absorption of atmospheric moisture and carbon dioxide. It should be noted that pronounced discoloration is likely to occur at temperatures above 140°F (60°C), whatever the gaseous pad.

Cleanout of lines and equipment containing JEFFAMINE T-403 polyetheramine can be accomplished using warm water and steam. In the event of spillage of this product, the area may be flushed with water. The proper method for disposal of waste material is by incineration with strict observance of all federal, state, and local regulations.

AVAILABILITY

JEFFAMINE T-430 polyetheramine is available in tank cars, tank wagons, 55-gallon (208L) drums of 440 pounds (200kg) net weight, and 5-gallon (19L) cans. Samples are available in North America and Asia by contacting our sample department at 1-800-662-0924. Samples in other locations, including Europe, are available by contacting any Huntsman Corporation sales office.

6209-0208

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Technical Service Europe: Technical Services Representative / Everberg Office / 32-2-758-9392

Main Offices Asia Pacific: Huntsman Singapore PTE / 150 Beach Road #37-00 Gateway West / Singapore 189720 / 65 6297 3363
Technical Service Asia Pacific: Huntsman Performance Products / 61 Market Road, Brooklyn, Victoria / Australia 3012 / 61 3 9933 6666

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